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Dataset Information:

Funding_Info: NOAA Climate Program Office; NOAA Ocean Acidification Program
Initial_Submission: 20160130
Revised_Submission: 20160130

Cruise Information:

Experiment Name: GU1404 Leg 1
Experiment Type: Research Cruise
Platform Type: Ship
Co2 Instrument Type: Equilibrator-IR or CRDS or GC
Cruise ID: 33GG20140704
Cruise Info: Marine Mammal Survey; AOML_SOOP_CO2
Geographical Region:
 Westernmost Longitude: -88.175
 Easternmost Longitude: -82.825
 Northernmost Latitude: 29.816
 Southernmost Latitude: 23.981
Cruise Dates (YYYYMMDD)
 Start_Date: 20140704
 End_Date: 20140716
Ports of Call:
 Pascagoula, MS
Vessel Name: Gordon Gunter
Vessel ID: 33GG
Vessel Owner: NOAA

Variables Information:

Variable Name: xCO2_EQU_ppm
Description of Variable: Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)

Unit of Variable: ppm

Variable Name: xCO2_ATM_ppm

Description of Variable: Mole fraction of CO2 measured in dry outside air (ppm)

Unit of Variable: ppm

Variable Name: xCO2_ATM_interpolated_ppm

Description of Variable: Mole fraction of CO2 in outside air associated with each water analysis. These values are interpolated between the bracketing averaged good xCO2_ATM analyses (ppm)

Unit of Variable: ppm

Variable Name: PRES_EQU_hPa

Description of Variable: Barometric pressure in the equilibrator headspace (hectopascals)

Unit of Variable: hPa

Variable Name: PRES_ATM@SSP_hPa

Description of Variable: Barometric pressure measured outside, corrected to sea level (hectopascals)

Unit of Variable: hPa

Variable Name: TEMP_EQU_C

Description of Variable: Water temperature in equilibrator (degrees Celsius)

Unit of Variable: Degree C

Variable Name: SST_C

Description of Variable: Sea surface temperature (degrees Celsius)

Unit of Variable: Degree C

Variable Name: SAL_permil

Description of Variable: Sea surface salinity on Practical Salinity Scale (permil)

Unit of Variable: ppt

Variable Name: fCO2_SW@SST_uatm

Description of Variable: Fugacity of CO2 in sea water at SST and 100% humidity (microatmospheres)

Unit of Variable: μ atm

Variable Name: fCO2_ATM_interpolated_uatm

Description of Variable: Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (microatmospheres)

Unit of Variable: μ atm

Variable Name: dfCO2_uatm

Description of Variable: Sea water fCO2 minus interpolated air fCO2 (microatmospheres)

Unit of Variable: μ atm

Variable Name: WOCE_QC_FLAG

Description of Variable: Quality control flag for fCO2 values (2=good, 3=questionable)

Unit of Variable: None

Variable Name: QC_SUBFLAG

Description of Variable: Quality control subflag for fCO2 values, provides explanation when QC flag=3

Unit of Variable: None

Method Description:

Equilibrator Design:

Depth of Seawater Intake: 5 meters

Location of Seawater Intake: Bow

Equilibrator Type: Sprayhead above dynamic pool, with thermal jacket

Equilibrator Volume: 0.95 L (0.4 L water, 0.55 L headspace)

Water Flow Rate: 1.5 - 2.0 L/min

Headspace Gas Flow Rate: 70 - 150 ml/min

Vented: Yes

Drying Method for CO₂ in Water:

Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).

Additional Information: Primary equilibrator is vented through a secondary equilibrator

CO₂ in Marine Air:

Measurement: Yes, 5 readings in a group every 3 hours

Location and Height: Bow mast, ~15 meters above sea surface

Drying Method:

Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).

CO₂ Sensor:

Measurement Method: Infrared absorption of dry sample gas

Manufacturer: LI-COR

Model: 7000

Frequency: Every 140 seconds, except during calibration

Resolution Water: 0.01 microatmosphere

Uncertainty Water: ± 1 microatmospheres

Resolution Air: 0.01 ppm

Uncertainty Air: ± 0.2 ppm

Manufacturer of Calibration Gas:

Scott-Marrin, Inc. - Std 1: JB03093, 0.00 ppm / Std 2: JA02267, 247.72 ppm / Std 3: JB03296, 382.61 ppm / Std 4: JA02689, 520.79 ppm

Number of Non Zero Gas Standards: 3

CO₂ Sensor Calibration:

The analyzer is calibrated every 2.3 hours with field standards that in turn were calibrated with primary standards that are directly traceable to the WMO scale. The zero gas is ultra-high purity air.

Other Comments:

Instrument is located in an air-conditioned laboratory. Ultra-High Purity air (0.0 ppm CO₂) and the high standard gas are used to zero and span the LI-COR analyzer.

Method References:

Pierrot, D., C. Neil, K. Sullivan, R. Castle, R. Wanninkhof, H. Lueger, T. Johannessen, A. Olsen, R. A. Feely, and C. E. Cosca (2009), Recommendations for autonomous underway pCO₂ measuring systems and data reduction routines, Deep-Sea Res II, 56, 512-522.

Details Co₂ Sensing:

details of CO₂ sensing (not required)

Measured Co₂ Params:

xco₂(dry)

Sea Surface Temperature:

Location: Right after SW pump in engine room, ~5.6 m below sea surface

Manufacturer: Seabird

Model: SBE-38

Accuracy Degrees Celsius: 0.001

Precision Degrees Celsius: 0.00025

Calibration: Factory calibration.

Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Equilibrator Temperature:

Location: Inserted into equilibrator ~5 cm below water level

Manufacturer: Hart

Model: 1521

Accuracy Degrees Celsius: 0.025

Precision Degrees Celsius: 0.001

Calibration: Factory calibration

Comments: Manufacturer's Resolution is taken as Precision.

Equilibrator Pressure:

Location: Attached to equilibrator headspace

Manufacturer: Setra

Model: 239

Accuracy hPa: 0.052

Precision hPa: 0.01

Calibration: Factory calibration

Comments:

Differential pressure reading from Setra-239 attached to the equilibrator headspace was added to the reading from the pressure transducer in the analyzer to yield the equilibrator pressure. Manufacturer's Resolution is taken as Precision.

Atmospheric Pressure:

Location: Next to the bridge, ~15 m above the sea surface water

Manufacturer: RMYoung

Model: 61201

Accuracy: ± 0.5 hPa

Precision: 0.01 hPa

Calibration: Factory calibration

Normalized: yes

Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Sea Surface Salinity:

Location: In Chem lab, next to CO2 system

Manufacturer: Seabird

Model: SBE 45

Accuracy: ± 0.005 permil

Precision: 0.0002 permil

Calibration: Factory calibration

Comments: Manufacturer's Resolution is taken as Precision.

Additional Information:

System had no communications with ship so NO LAT/LONG and NO SCS Data. These info were imported from data file provided by ship. Differential EQU Pressure a bit more variable than usual, with values reading -6 uatm. So is the EQU gas flow... (~180 values flagged 3 because flow < 50 ml/min. low flow sporadic so xCO2 values probably good. 1st measurement of STD3 was off. Was flagged 4 and not used. Only 3 standards were used to correct xco2 between the 1st and 2nd set of STDs.

Preliminary Quality Control:

NA

Form Type:

underway